

APPLICANT'S REMARKS

The 03/23/06 Office Action indicates that particular pending claims are rejected under 35 USC § 102, based on various prior art references. Each of these rejections are considered below.

Claim Rejections under 35 USC 102

The 03/23/06 Office Action indicates that claims 1, 2, 5, 6, 10, 30, 31, 34, 35, 38, 39, and 41 stand rejected under 35 USC § 102 (b), as being anticipated by Sun et al. (US 5,677,594) stating:

"Regarding claims 1, 2, 5, 6, 10, 30, 31, 34, 35, 38, 39, and 41, Sun discloses the use of light emitting device including a white emitting mixture of $\text{Sr}_{0.5}\text{Ca}_{0.5}\text{Ga}_2\text{Se}_4\text{:Ce,F}$. (Column 5 lines 5-35). The activator would be doped in concentrations of between .0001% and 10% mol percent respectively. Further Sun discloses the use of multiple phosphors with difference activators in order to generate white light. (Column 2 line 4-16)."

Applicants understand that according to MPEP 8th ed. ; §706.02 pp 700-21, col. 1, under the heading: DISTINCTION BETWEEN 35 U.S.C 102 AND 103 , that for anticipation under 35 USC § 102 to be proper, *"the reference must teach every aspect of the claimed invention"*.

As regards the Sun et al. reference, Applicants note that the Sun et al. reference passage noted in the Office Action describes fabrication of a multi-layered phosphor structure having three layers, which is distinct from Applicant's materials, which are homogeneous per our described preparative methods. In Sun et al, there is first, what we can conveniently refer to as a "base" zinc sulfide layer (col. 5, line 7). On top of this zinc sulfide base layer is next deposited a layer of a second material (which comprises a "middle" layer) which may be: 1) alkaline earth sulfide; 2) alkaline earth selenide; or 3) alkaline earth sulfide selenide having a rare earth dopant therein (col. 5, lines 8-10). Then, on top of the "middle layer" is subsequently deposited an

"overlayer" (Sun's word) which may be: 1) an alkaline earth thiogallate; 2) an alkaline earth thioindate; 3) an alkaline earth thioaluminate; 4) an alkaline earth selenoindate; 5) an alkaline earth selenoaluminate; or 6) an alkaline earth selenogallate (col. 5, lines 10-14). Sun et al continues at lines 14-15 to mention specific compounds, CaIn_2Se_4 , SrAl_2Se_4 , and $\text{Ca}_{0.5}\text{Sr}_{0.5}\text{Ga}_2\text{Se}_4$. However, Applicants' independent claims 1, 30 both contain the limitation that x, y are both *between* 0 and 1; thus Applicants' claimed compositions require the presence of both selenium and sulfur. The Sun et al. compositions lack both Se and S within Applicants claimed ranges, and the remaining elements in Applicants' claims in the relative ratios and molar amounts specified. Sun et al continues at col. 5, line 15 to describe the thickness of the layers, then the method of deposition (lines 19-22), and the preferred dopant concentration (lines 22-24). Deposition of an overlayer and its thickness is described at lines 25-30. Specific compounds are described in lines 31-35 of col. 5, but no compounds which anticipate Applicants independent claims 1, 30 are present. Moreover, the compositions of Sun et al. are clearly multi-layer structures of different materials, whereas those claimed by Applicants are not multi-layer, as taught in the examples on pages 27-29 of the original specification. Sun et al does not teach a single composition within all limitations of Applicants' independent claims 1, 30 nor hence any claims dependent therefrom. Applicants therefore respectfully submit that the compounds of their claims 1, 30 and accordingly their dependent claims, are not anticipated by the Sun et al reference as specified in the 03/23/06 Office Action because Sun et al. does not specifically nor inherently teach the exact compositions claimed. Applicants respectfully request that the rejection under 35 USC § 102(b) of claims 1, 2, 5, 6, 10, 30, 31, 34, 35, 38, 39, and 41 based on the Sun et al. reference should be reconsidered, and withdrawn.

Applicants have amended claims 2, 3, 4, 5, 31, 32, 33, 34 herein to specifically exclude the possibility for either x or y to be zero, and to be consistent with the original language of independent claims 1 and 30, each of which specify that x and y are each *between* 0 and 1. The double brackets convention is used in these claim amendments because the changes would be hard to perceive with strikethroughs. Claims 6, 7, 21, 22, 35, 36 have been similarly amended to exclude cases where x and y are zero.

For clarity, claim 2, has been amended to replace all "less than or equal to" signs in each of the ranges for x and y with "less than" signs.

In claim 3, the second "less than or equal to" sign in the range for x has been replaced with a "less than" sign, and the first "less than or equal to" sign in the range for y has been replaced with a "less than" sign.

In claim 4, the first "less than or equal to" sign in each of the ranges for x and y have been replaced with a "less than" sign.

In claim 5, the first "less than or equal to" sign in the range for x has been replaced with a "less than" sign, and the second "less than or equal to" sign in the range for y has been replaced with a "less than" sign.

In claim 31, all of the "less than or equal to" signs in each of the ranges for x and y have been replaced with "less than" signs.

In claim 32, the second "less than or equal to" sign in the range for x has been replaced with a "less than" sign, and the first "less than or equal to" sign in the range for y has been replaced with a "less than" sign.

In claim 33, the first "less than or equal to" sign in each of the ranges for x and y has been

replaced with a "less than" sign.

In claim 34, the first "less than or equal to" sign in the range for x has been replaced with a "less than" sign, and the second "less than or equal to" sign in the range for y has been replaced with a "less than" sign.

No new matter is entered by these claim amendments. Support is in the original specification immediately after each molecular formula, and in the original claim language of: "... any value between 0 and 1, ..." in each independent claim.

The 03/23/06 Office Action indicates that claims 16-18, 22, 25, 26, 30, 31, 32, 26, and 39 stand rejected under 35 USC § 102 (e), as being anticipated by Chua et al. (US 2005/0156510) stating:

"Regarding claims 16-18, 22, 25, 26, 30, 31, 32, 26, and 39, Chua discloses the use of light emitting device including a white emitting mixture of $\text{BaGa}_4\text{S}_7\text{:Eu}$. (Paragraph 0024). The activator would be doped in concentrations of between .0001% and 10% mol percent respectively. Further the phosphors are used on an device with a blue emitting diode. (Paragraph 0017).

Applicants note that the Chua reference does not teach a phosphor which contains both sulfur and selenium, and the compound cited in the 03/23/06 Office Action ($\text{BaGa}_4\text{S}_7\text{:Eu}$) contains no selenium. Claim 16 specifies that each of x and y are between 0 and 1 and therefore Applicants' claim 16 and all claims depending therefrom (claims 17-24) must have both Se and S present. In view of this, the Chua reference does not anticipate claims 16-24 because it does not provide a phosphor in which Se and S are both present. Since the Chua et al reference does not teach phosphors meeting the description of Applicant's claim 16, Applicants request that the rejection under 35 USC 102(e) of claims 16-18, 22, 25, 26 based on the Chua et al reference be reconsidered and withdrawn.

Claims 17, 18, 19, 20 have been amended herein to clearly exclude cases where both x and y are zero.

For clarity, claim 17, has been amended to replace all "less than or equal to" signs in each of the ranges for x and y with "less than" signs.

In claim 18, the second "less than or equal to" sign in the range for x has been replaced with a "less than" sign, and the first "less than or equal to" sign in the range for y has been replaced with a "less than" sign.

In claim 19, the first "less than or equal to" sign in each of the ranges for x and y have been replaced with a "less than" sign.

In claim 20, the first "less than or equal to" sign in the range for x has been replaced with a "less than" sign, and the second "less than or equal to" sign in the range for y has been replaced with a "less than" sign.

Applicants' claims 25-29 contain the limitation that the phosphor used in the claimed light emitting device contains both Se and S, and since the Chua et al reference does not teach phosphors containing both S and Se, these claims are believed to be not anticipated by the Chua et al. reference.

Applicant's claim 30 contains the same limitation as claims 16, 25, that the values for x, y are between 0 and 1 which means that the presence of both Se and S is a limitation of Applicants' claim 30. Since the Chua et al reference does not teach phosphors meeting the description of Applicant's claim 30, Applicants request that the rejection under 35 USC 102(e) of claims 30, 31, 32, 26, and 39 based on the Chua et al reference be reconsidered and withdrawn.

The 03/23/06 Office Action indicates that claims 16-18, 22, 24-28, 30, 31, 32, 26, and 38-42 stand rejected under 35 USC § 102 (b), as being anticipated by Yano et al. (US 2002/0064682) stating:

"Regarding claims 16-18, 22, 24-28, 30, 31, 32, 26, and 38-42, Yano discloses the use of light emitting device including a white emitting mixture of BaGa₄S₇:Eu. (Paragraph 0046). The activator would be doped in concentrations of between .0001% and 10% mol percent respectively. Further Yano discloses the use of multiple phosphors with difference activators in order to generate white light. (Paragraph 0047)."

Applicant's respectfully submit that instant independent claims 16, 25, and 30 all contain the claim limitation that the phosphors specified therein must contain both Se and S. The Yano reference teaching of BaGa₄S₇:Eu does not include Se. Therefore, since the Yano et al. reference does not teach phosphors meeting the description of Applicant's independent claims 16, 25, 30, the rejection under 35 USC 102(b) of claims 6-18, 22, 24-28, 30, 31, 32, 26, and 38-42 based on the Yano et al. reference should be reconsidered and withdrawn.

The 03/23/06 Office Action indicates that claims 1, 2, 3, 7, 8, 30, 31, 32, 36, 37, and 39 stand rejected under 35 USC § 102 (b), as being anticipated by Velthaus et al. (US 5,505,986) stating:

"Regarding claims 1, 2, 3, 7, 8, 30, 31, 32, 36, 37, and 39, Velthaus discloses the use of light emitting device including a white emitting mixture of ZnSrGa₂S₄:Ce. (Column 3, lines 20-34). The activator would be doped in concentrations of between .0001% and 10% mol percent respectively."

Applicant's respectfully submit that instant independent claims 1, 30 each contain the claim limitation that the phosphors specified therein must contain both Se and S. The Velthaus

et al reference teaching of $\text{ZnSrGa}_2\text{S}_4\text{:Ce}$ does not include Se. Therefore, since the Velthaus et al. reference does not teach phosphors meeting the description of Applicant's independent claims 1, 30, the rejection under 35 USC 102(b) of claims 1, 2, 3, 7, 8, 30, 31, 32, 36, 37, and 39 based on the Velthaus et al. reference should be reconsidered and withdrawn.

The 03/23/06 Office Action indicates that claims 1-3, 7, 10-14, 30-32, 36, and 38-42 stand rejected under 35 USC § 102 (b), as being anticipated by Juestel et al. (US 2002/0105266) stating:

"Regarding claims 1-3, 7, 10-14, 30-32, 36, and 38-42, Juestel discloses the use of light emitting diode including a white emitting phosphor mixture of (Sr, Ca, Ba)(Al,Ga) $_2$ S $_4$:Eu and CaLa $_2$ S $_4$:Ce. (Paragraphs 0028 and 0031). The activator would be doped in concentrations of between .0001% and 10% mol percent respectively. Further the diode emits light in the UV-Blue range to excite the stated phosphors."

Applicant's respectfully submit that instant independent claims 1, 11, 30 each contain the claim limitation that the phosphors specified therein must contain both Se and S. The Juestel et al reference teachings of (Sr, Ca, Ba)(Al,Ga) $_2$ S $_4$:Eu and CaLa $_2$ S $_4$:Ce do not include Se. Therefore, since the Juestel et al. reference does not teach phosphors meeting the description of Applicant's independent claims 1, 11, 30, the rejection under 35 USC 102(b) of claims 1-3, 7, 10-14, 30-32, 36, and 38-42 based on the Juestel et al. reference should be reconsidered and withdrawn.

Applicants believe all claim rejections specified in the Office Action dated 03/23/06 have been investigated and addressed in this Response; any oversight is unintentional. We believe that in view of the claim amendments and arguments presented that claims 1-42 should now be in

condition for allowance.

Applicants are grateful for all consideration received, especially the Examiner's keen awareness in pointing out allowable subject matter in the 03/23/06 Office Action, by identifying claims that were merely "objected to".

Thank you for your kind consideration.

Respectfully submitted,

A handwritten signature in black ink, reading "Christopher J. Whewell". The signature is written in a cursive, flowing style with a large initial "C".

Christopher J. Whewell, Reg. 37,469
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